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THE BRYOPHYTES OF MICHIGAN WITH PARTICULAR REFERENCE TO THE DOUGLAS LAKE REGION*

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Our knowledge of the bryophyte flora of Michigan seems to be limited to five published lists, of which three are based on collections from Isle Royale, the extreme northern outpost of the state. Of these three, the first in order, by Holt¹, records 38 mosses; the second, by Cooper², raises the number of mosses to 104; the third, by Conklin³, records 36 liverworts. Of the two remaining papers one by Kauffman⁴, based in large measure on specimens collected in southern Michigan, records a total of 131 liverworts and mosses; the other by Praeger⁵ records 10 species of *Sphagnum* from the vicinity of Douglas Lake.

The present paper, like Praeger's, is the outcome of investigations carried on at the University of Michigan Biological Station, situated on Douglas Lake, and is based primarily on collections made by the writer during the summers of 1920 and 1921. By far that larger number of records are from the immediate vicinity of Douglas and Burt Lakes, in Cheboygan County, but collections were also made in the vicinity of Pellston, Cecil Bay, and Big Stone Bay, in Emmet County, and on Mackinac Island, in Mackinac County. Cheboygan and Emmet Counties are the northernmost counties in the southern peninsula of Michigan, while Mackinac Island lies in the straits of Mackinac, between Lakes Michigan and Huron. A few scattered records are included from the southern shores of the northern peninsula of Michigan (Prentis Bay and Scotty Bay), based on collections by Dr. J. H. Ehlers, who is responsible also for a number of records from other localities.

* Contribution from the Osborn Botanical Laboratory.

¹ Helt, W. P. Notes on the vegetation of Isle Royale, Michigan. In "An ecological survey of Isle Royale, Lake Superior", prepared under the direction of C. C. Adams. Lansing. 1908 (1909).

² Cooper, W. S. A list of mosses collected upon Isle Royale, Lake Superior. *BRYOLOGIST* **16**: 1-8. 1913.

³ Conklin, G. H. A list of Hepaticae collected upon Isle Royale, Lake Superior. *BRYOLOGIST* **17**: 46-48, 52-55. 1914.

⁴ Kauffman, C. H. A preliminary list of the bryophytes of Michigan. *Mich. Acad. Sci. Rep.* **17**: 217-223. 1915.

⁵ Praeger, W. E. A collection of sphagnum from the Douglas Lake region, Cheboygan County, Michigan. *Mich. Acad. Sci. Rep.* **21**: 237, 238. 1919.

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Holt's Isle Royale list includes the following 8 mosses which are not known to have been found elsewhere in the state and which were not subsequently collected on that island by Cooper.

<i>Dicranum longifolium</i> Ehrh.	<i>Bryum pallens</i> Sw.
<i>Grimmia unicolor</i> Hook.	<i>Hygrohypnum polare</i> (Lindb.) Broth.
<i>Ulota americana</i> (Beauv.) Limpr.	<i>Neckera oligocarpa</i> Bruch
<i>Paludella squarrosa</i> (L.) Brid.	<i>Dichelyma uncinatum</i> Mitt.(?)

Cooper lists 12 additional mosses from Isle Royale which are not definitely known to occur elsewhere in the state, as follows:

<i>Polytrichum alpinum</i> L.	<i>Splachnum ampullaceum</i> L.
<i>Cynodontium polycarpum</i> (Ehrh.) Schimp.	<i>Bryum inclinatum</i> (Sw.) Bland.
<i>Grimmia ovata</i> Schwaegr.	<i>Bryum Mühlenbeckii</i> Br. & Sch.
<i>Racomitrium canescens</i> (Timm) Brid.	<i>Mnium subglobosum</i> Br. & Sch.
<i>Encalypta procera</i> Bruch	<i>Amblystegium fluviatile</i> (Sw.) Br. & Sch.
<i>Anoetangium lapponicum</i> Hedw.	<i>Calliergon Richardsonii</i> (Mitt.) Kindb.

Both Holt and Cooper list *Sphagnum subsecundum* Nees (as *S. platyphyllum* Sull.).

Conklin's list of Isle Royale liverworts includes the following 5 species not elsewhere recorded from Michigan.

<i>Cephalozia bicuspidata</i> (L.) Dumort.	<i>Lophozia Lyoni</i> (Tayl.) Steph.
<i>Lophozia heterocolpa</i> (Thed.) Howe	<i>Sphenobolus minutus</i> (Crantz) Steph.
<i>Lophozia longidens</i> (Lindb.) Macoun	

Kauffman records 28 liverworts and mosses which appear on no other Michigan list (including the present one); viz.:

<i>Ricciella fluitans</i> (L.) A. Br.	<i>Bryum affine</i> (Bruch) Lindb.
<i>Ricciocarpus natans</i> (L.) Corda	<i>Aulacomnium heterostichum</i> (Hedw.) Br. & Sch.
<i>Lunularia cruciata</i> (L.) Dumort.	<i>Fontinalis antipyretica</i> L.
<i>Reboulia hemisphaerica</i> (L.) Radl. & Sch.	<i>Entodon cladorrhizans</i> (Hedw.) C. Müll.
<i>Calypogeia suecica</i> (Arn. & Pers.) Warnst. & Loeske	<i>Entodon seductrix</i> (Hedw.) C. Müll.
<i>Porella pinnata</i> L.	<i>Leskea obscura</i> Hedw.
<i>Pleuroidium alternifolium</i> (Dicks.) Rabenh.	<i>Thelia asprella</i> (Schimp.) Sull.
<i>Ditrichum pallidum</i> (Schreb.) Hampe	<i>Brachythecium acuminatum</i> (Hedw.) Kindb.
<i>Ditrichum tortile</i> (Schrad.) Lindb.	<i>Brachythecium acutum</i> (Mitt.) Sull.
<i>Fissidens taxifolius</i> (L.) Hedw.	<i>Oxyrrhynchium praelongum</i> (Hedw.) Warnst.
<i>Barbula fallax</i> Hedw.	<i>Rhynchostegium serrulatum</i> (Hedw.) Jaeg.
<i>Barbula unguiculata</i> (Huds.) Hedw.	<i>Thamnum allegheniense</i> (C. Müll.) Br. & Sch.
<i>Tortula subulata</i> (L.) Hedw.	
<i>Orthotrichum Braunii</i> Br. & Sch.	
<i>Orthotrichum ohioense</i> Sull. & Lesq.	
<i>Physcomitrium turbinatum</i> (Michx.) C. Müll.	

The lists of both Cooper and Kauffman include two additional bryophytes which have not been collected in the region covered by the present investigation, namely *Bryum intermedium* (Ludw.) Brid. and *Stereodon curvifolius* (Hedw.) E. G. Britton; while both Conklin and Kauffman list *Jungermannia lanceolata* L. and *Porella platyphylla* (L.) Lindb¹. To these should be added, as not elsewhere recorded for Michigan, *Anacamptodon splachnoides* (Froel.) Brid. and *Elodium paludosum* (Sull.) Loeske, collected by the writer at Lakeside, Berrien County, in 1910.

Of the 261 species to be noted in the present paper as occurring in the Douglas Lake region, no less than 101 appear not to have been previously reported from the state. These species will be marked with a star (*).

For a country of moderately rolling topography with little rugged relief, a country of sands and gravels with almost no outcrops of bed rock (except at Mackinac Island), a country which has been almost completely lumbered and more or less extensively burned over, the comparative richness in species of the bryophyte flora in the Douglas Lake region, at first thought, seems almost incredible. But this diversity is at once explained by the surprising variety of habitats which this region, superficially so lacking in promise, reveals upon closer examination. The principal types of habitat, in so far as these are of bryological importance are as follows:

The Hardwoods.—The magnificent forests of beech, sugar maple and hemlock which, with white pine, formerly covered the uplands throughout this region are now represented only by occasional primeval stands and by somewhat more frequent second-growth tracts of woodland.

The Aspens.—The prevailing type of vegetation on uplands today is dry open woodland, more or less densely populated by aspen, with a sprinkling of other trees.

The Lake Bluffs.—Steep embankments, usually of gravel and from three or four to more than fifty feet high, border the shores of Douglas and Burt Lakes in several localities, affording conditions favorable to many bryophytes which are found in no other type of habitat.

Sandy Lake Shores.—Sandy lake shores in general possess little of bryological interest. Certain species, however, appear to be restricted to the beaches, growing at about the level of winter high water mark, but for the most part only in places where the ground remains quite moist, even in summer.

Rocks and Cliffs.—Through most of this region the only rock substrata are afforded by the scattered to locally abundant glacial boulders; but Mackinac Island abounds in rocks and cliffs, here as elsewhere mainly limestone.

The Gorge.—One of the most striking physiographic features of the region

¹The majority of American specimens formerly referred to *P. platyphylla*, however, are now assigned to *P. platyphylloidea* (Schwein.) Lindb., and only one apparently authentic Michigan record for the true *P. platyphylla* is known, viz., a specimen collected at Ann Arbor in 1907 by Dr. Conklin.

is this steep-flanked ravine, its floor from sixty to seventy feet lower than the surrounding upland and in which occur the "Big Springs", sources of Carp Creek. The Gorge is situated about a mile from the Biological Station.

The Streams.—There are a number of these, varying in size, in flow and swiftness, in temperature, and in character of banks, but all agree in having a sandy, gravelly or muddy floor, rocky stream beds being conspicuously lacking in this region.

Coniferous Forest Swamps.—Low wet grounds commonly are wooded mainly with white cedar and black spruce. A typical swamp of this kind is Reese's Bog, about a mile from the Station, which occupies a strip perhaps two miles long and up to half a mile wide along the northern shore of Burt Lake. The tamarack predominates locally in wooded swamps, more especially in areas that have been burned over.

Open Marshy Swamps.—These are characterized typically by the abundance of sedges and grasses and the scarcity of sphagnum. Commonly they are periodic swamps and the underlying mineral soil is but sparingly covered with organic debris.

Open Sphagnum Bogs.—These are of the familiar sort, characterized by the abundance of sphagnum mosses and ericaceous shrubs and by the presence of a deep peaty substratum.

In the detailed list which follows, generally speaking, the habitat relations of each species are indicated, together with its comparative frequency in the region under consideration. For the majority of species definite stations are cited, these stations being represented by specimens in the Herbarium of Yale University and most of them also by duplicate specimens in the Herbaria of the New York Botanical Garden and of the University of Michigan. For species recorded as "common", however, as well as for some of those recorded as "frequent", specific stations are not given: in all such cases a definite "Douglas Lake" station can be assumed. Except where otherwise noted, all records are based on the writer's collections. Of the localities mentioned, aside from those that can be found on any good map of this region or for which the name given is self-explanatory, Fontinalis Run, Reese's Bog, and Colonial Point adjoin Burt Lake; North and South Fishtail, Grapevine Point, Polypody Bluff, Bryant's, Fairy Island, and Pine Point border on Douglas Lake; while Lancaster, Munro, Vincent and Mud Lakes, together with the various "bogs", are all in this immediate vicinity.

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Marchantiaceae

CONOCEPHALUM CONICUM (L.) Dumort. Common along overhanging banks of streams in moist woods.

MARCHANTIA POLYMORPHA L. Common on wet ground in the open, but especially in swamps that have recently been burned over.

PREISSIA QUADRATA (Scop.) Nees. Frequent in wet open situations, on earth banks and logs. Carp Creek; Mackinac Island.

Metzgeriaceae

PALLAVICINIA FLOTOWIANA (Nees) Lindb.* Locally abundant on wet sandy lakeshore at North Fishtail.

PALLAVICINIA LYELLII (Hook.) S. F. Gray. Locally abundant on wet sandy shores at Vincent Lake.

PELLIA EPIPHYLLA (L.) Corda. Sandy roadside in swampy woods; rare in Reese's Bog.

PELLIA FABRONIANA Raddi.* Shaded, overhanging stream banks and lake shores; frequent. North Fishtail; Big Stone Bay.

PELLIA NEESIANA (Gottsche) Limpr. Locally abundant along wet muddy shores of Maple River, west of Pellston.

RICCARDIA LATIFRONS Lindb. On rotten logs; common in wet woods.

RICCARDIA MULTIFIDA (L.) S. F. Gray. Swampy woods along Carp Creek; locally abundant.

RICCARDIA PINGUIS (L.) S. F. Gray. Floating in Smith's Bog; rare.

Jungermanniaceae

BAZZANIA TRILOBATA (L.) S. F. Gray.* On ground, logs and stumps; common in moist woods.

BLEPHAROSTOMA TRICHOHYLLUM (L.) Dumort. On logs and ground in swampy woods; Reese's Bog.

CALYPOGEIA NEESIANA (Massal. & Carest.) C. Müll.* On logs, stumps and ground in moist woods; occasional. Reese's Bog; Mackinac Island.

CALYPOGEIA PALUDOSA Warnst.* On wet ground in an open bog; Mud Lake.

CALYPOGEIA TRICHOMANIS (L.) Corda. On shaded banks and earth in woods; frequent. Carp Creek; Colonial Point.

CALYPOGEIA CATENULATA (Hüb.) Spruce.* On a rotten log in moist woods; Gorge.

CALYPOGEIA CONNIVENS (Dicks.) Lindb.* On wet ground in Bryant's Bog.

CALYPOGEIA CURVIFOLIA (Dicks.) Dumort. On logs; common in moist woods.

CEPHALOZIA FLUITANS (Nees) Spruce.* On wet ground or floating; frequent in open bogs. Mud Lake; Bryant's Bog.

CEPHALOZIA MEDIA Lindb. On logs and banks; frequent in moist woods. Reese's Bog; Vincent Lake.

CEPHALOZIA PLENICEPS (Aust.) Lindb.* On logs in wet woods; occasional. Reese's Bog; Carp Creek.

CEPHALOZIELLA HAMPEANA (Nees) Schiffn. On moist earth in wood road near North Fishtail.

CEPHALOZIELLA SULLIVANTH (Aust.) Evans.* Moist sandy bank in woods near Smith's Bog.

CHILOSCYPHUS FRAGILIS (Roth) Schiffn.* Floating in springs and cold brooks; locally abundant. Reese's Bog; Carp Creek; Scotty Bay Creek (Ehlers).

CHILOSCYPHUS PALLESCENS (Ehrh.) Dumort. On wet logs and ground in open swampy woods; frequent. Smith's Bog; Reese's Bog.

FRULLANIA ASAGRAYANA Mont. On trunk of tree in Reese's Bog.

FRULLIANA BRITTONIAE Evans.* On a tree near Douglas Lake (Mrs. E. W. Brown).

FRULLANIA EBORACENSIS Gottsche. Common on trunks of trees in open woods.

GEOCALYX GRAVEOLENS (Schrad.) Nees. On rotten logs and banks; occasional in moist woods. Reese's Bog; Mackinac Island.

HARPANTHUS SCUTATUS (Web. f. & Mohr) Spruce. On rotten logs; frequent in moist woods.

JAMESONIELLA AUTUMNALIS (D. C.) Steph. On earth and rotten logs; common on lake bluffs and in moist woods.

LEPIDOZIA REPTANS (L.) Dumort. On earth and logs; common in moist woods.

LEPIDOZIA SETACEA (Web.) Mitt.* On wet ground in Mud Lake Bog (L. Blinks).

LOPHOCOLEA HETEROPHYLLA (Schrad.) Dumort. Common on earth along lake bluffs and in moist woods.

LOPHOCOLEA MINOR Nees. Common on moist gravelly soil along lake bluffs.

LOPHOZIA BADENSIS (Gottsche) Schiffn.* On wet or moist shaded banks; common on Mackinac Island.

LOPHOZIA BARBATA (Schreb.) Dumort. Moist gravelly lake bluffs; locally abundant at Douglas Lake.

LOPHOZIA EXCISA (Dicks.) Dumort.* Gravelly lake bluff at south end of Burt Lake.

LOPHOZIA INCISA (Schrad.) Dumort. On shaded banks and rotten logs. Reese's Bog; Carp Creek; Douglas Lake.

LOPHOZIA KAURINI (Limpr.) Steph. Local on wet sandy lake shore; North Fishtail.

LOPHOZIA MARCHICA (Nees) Steph.* On wet ground in Reese's Bog.

LOPHOZIA PORPHYROLEUCA (Nees) Schiffn. On moist ground and logs in Reese's Bog.

MYLIA ANOMALA (Hook.) S. F. Gray.* Frequent in open sphagnum bogs. *ODONTOSCHISMA DENUATUM* (Mart.) Dumort.* On a wet rotten log in the Gorge.

PLAGIOCHILA ASPLENIODES (L.) Dumort. Common on moist gravelly lake bluffs and on banks and logs in wet woods.

PORELLA PLATYPHYLLOIDEA (Schwein.) Lindb. Common on trees in moist woods.

PTILIDIUM CILIARE (L.) Nees. On a moist shaded bank; south end of Burt Lake.

PTILIDIUM PULCHERRIMUM (Web.) Hampe. Common on logs, stumps and tree trunks in wet or moist woods.

RADULA COMPLANATA (L.) Dumort. Common on bark of trees in moist woods.

SCAPANIA CURTA (Mart.) Dumort. On the ground along lake bluffs; local at Douglas Lake.

SCAPANIA GLAUCEOCEPHALA (Tayl.) Aust.* On logs in moist woods; occasional near Douglas Lake.

SCAPANIA IRRIGUA (Nees) Dumort.* Wet sandy ground; rare. Reese's bog; Vincent Lake.

SCAPANIA NEMOROSA (L.) Dumort.* On earth and logs in wet woods and along lake shores; rare. Vincent Lake; Douglas Lake.

SPHENOLOBUS EXSECTAEFORMIS (Breidl.) Steph.* On rotten log in Reese's Bog; rare.

SPHENOLOBUS HELLERIANUS (Nees) Steph.* On rotten log in Reese's Bog; rare.

SPHENOLOBUS MICHAUXII (Web. f. & Mohr) Steph. On rotten log in Reese's Bog; rare.

TRICHOCOLEA TOMENTELLA (Ehrh.) Dumort. Common on the ground in swampy woods.

Anthocerotaceae

ANTHOCEROS LAEVIS L. On moist earth along a wood road in Reese's Bog.

Sphagnaceae

SPHAGNUM CAPILLACEUM (Weis) Schrank. Common in open bogs.

SPHAGNUM CAPILLACEUM TENELLUM (Schimp.) Andrews. Common in open bogs.

SPHAGNUM COMPACTUM DC.* Locally abundant in wet sandy depressions near Douglas Lake.

SPHAGNUM CUSPIDATUM Ehrh. Common in wet depressions in open bogs.

SPHAGNUM DUSENII C. Jens. Common in wet open bogs.

SPHAGNUM FUSCUM (Schimp.) H. Klinggr. Common in bogs.

SPHAGNUM GIRGENSOHNII Russow. Common in wooded bogs and swamps.

SPHAGNUM MAGELLANICUM Brid. Common in bogs and swamps.

SPHAGNUM PALUSTRE L. Frequent in wooded swamps. Ingle side; Vincent Lake.

SPHAGNUM PAPILLOSUM Lindb. Locally abundant in Mud Lake Bog.

SPHAGNUM RECURVUM Beauv. Common in bogs.

SPHAGNUM RECURVUM TENUE H. Klinggr. Frequent in Gleason's and Bryant's Bogs.

SPHAGNUM ROBUSTUM (Russow) Röll. Locally abundant in Bryant's Bog.

SPHAGNUM SQUARROSUM Crome. Frequent in swampy woods. Gorge; Reese's Bog; Big Stone Bay.

SPHAGNUM SUBBICOLOR Hampe.* Frequent in Bogs. Reese's Bog; Big Stone Bay.

SPHAGNUM TERES (Schimp.) Aongstr. Locally abundant in Mud Lake Bog.

SPHAGNUM WARNSTORFII Russow. In boggy, wooded swamp; Reese's Bog.

SPHAGNUM WULFIANUM Girg. Locally abundant in boggy wooded swamps. Reese's Bog.

Dicranaceae

CERATODON PURPUREUS (L.) Brid. On earth and other substrata; very common in open situations and the most abundant moss in the aspens.

DICRANELLA GREVILLEANA (Brid.) Schimp.* Locally abundant on a moist clayey bank; Mackinac Island.

DICRANELLA HETEROMALLA (L.) Schimp. On the ground; frequent in upland woods. Mud Lake Hardwoods; Lancaster Lake (Ehlers); Pellston; Colonial Point.

DICRANELLA RUBRA (Huds.) Kindb.* Locally abundant on a moist clayey bank; Mackinac Island.

DICRANELLA SCHREBERI (Sw.) Schimp. Locally common along a wet, sandy lake shore; North Fishtail.

DICRANUM BERGERI Bland.* On the ground; occasional in bogs and wet woods. Mud Lake Bog; Big Stone Bay.

DICRANUM BONJEANII De Not.* On ground; frequent in open sandy woods. Reese's Bog; Pine Point, Cecil Bay.

DICRANUM CONDENSATUM Hedw.* On the ground; locally abundant in open sandy blueberry barrens near Big Stone Bay.

DICRANUM DRUMMONDII C. Mull.* On the ground, probably common in wet woods. Reese's Bog.

DICRANUM FLAGELLARE Hedw. Rotten stumps and logs, and bases of trees; common in moist woods.

DICRANUM FUSCESCENS Turn. On the ground, logs, and stumps; frequent in moist woods. Reese's Bog; Big Stone Bay.

DICRANUM MONTANUM Hedw. On rotten logs and stumps; common in moist woods.

DICRANUM MÜHLENBECKII Br. & Sch.* On the ground in woods; Big Stone Bay.

DICRANUM RUGOSUM (Hoffm.) Brid. On logs, stumps, and the ground; common in moist or wet woods.

DICRANUM SCOPARIUM (L.) Hedw. Logs, stumps and ground; common in woods.

DICRANUM VIRIDE (Sull. & Lesq.) Lindb.* According to R. S. Williams *D. viride* is a synonym of *D. fulvum* Hook. On logs and trunks of trees; common in moist woods.

DICRANUM FLEXICAULE (Schleich.) Hampe.* Locally abundant along an open gravelly roadside near the shore; Mackinac Island.

ONCOPHORUS WAHLENBERGII Brid. On shaded logs; common but seldom abundant.

SAELANIA GLAUDESCENS (Hedw.) Broth. Rare on gravelly lake bluffs along shores of Douglas Lake.

SELIGERIA CAMPYLOPODA Kindb.* On limestone boulders and stones in moist woods. Rare at Colonial Point; frequent on Mackinac Island.

Leucobryaceae

LEUCOBRYUM GLAUCUM (L.) Schimp. On the ground in moist woods; frequent. Douglas Lake vicinity (Ehlers); Reese's Bog; Colonial Point.

Fissidentaceae

FISSIDENS ADIANTOIDES (L.) Hedw.* On the ground, logs, and tree bases; common in wet woods and along moist lake-shores.

FISSIDENS CRISTATUS Wils. Frequent in the same sort of situations as the preceding species. Reese's Bog; Pellston Hardwoods.

FISSIDENS OSMUNDIOIDES (Sw.) Hedw. Occasional on tree bases in wet woods and on moist sandy lake shores. Douglas Lake; Reese's Bog.

FISSIDENS VIRIDULUS (Sw.) Wahl.* On ledges and stones in moist woods; common on Mackinac Island.

Pottiaceae

BARBULA CONVOLUTA Hedw.* On moist gravelly or sandy banks; occasional. Fairy Island; Colonial Point; Big Stone Bay.

DIDYMODON LURIDUS Hornsch.* Limestone cliffs and boulders; locally common along the lake shore at Mackinac Island.

DIDYMODON RUBELLUS (Hoffm.) Br. & Sch.* Wet logs and rocks; locally common. Carp Creek; Mackinac Island.

ENCALYPTA CILIATA (Hedw.) Hoffm. Common on a moist gravelly lake bluff; Fairy Island.

ENCALYPTA CONTORTA (Wulf.) Lindb.* Lake bluffs, sand dunes, and earth; occasional. Bryant's; Cecil Bay; Mackinac Island.

ENCALYPTA RHABDOCARPA PILIFERA (Funck) Nees & Hornsch.* Very local on a moist gravelly lake bluff; Fairy Island.

GYMNOSTOMUM RUPESTRE Schleich.* Moist shaded limestone ledges; occasional near the shore on Mackinac Island.

TORTELLA CAESPITOSA (Schwaegr.) Limpr.* Rare on gravelly lake bluff at Fairy Island.

TORTELLA FRAGILIS (Drumm.) Limpr.* Rare on sandy or gravelly banks along lake shores. Bryant's; Cecil Bay.

TORTELLA TORTUOSA (L.) Limpr. Rocks, and gravelly or sandy banks; locally common. Fairy Island; Cecil Bay; Big Stone Bay; Mackinac Island.

TORTULA MUCRONIFOLIA Schwaegr.* On moist gravelly lake bluffs; locally common. Fairy Island; Colonial Point.

TORTULA RURALIS (L.) Ehrh. Open sandy or gravelly ground; locally abundant. Cecil Bay; Big Stone Bay; Mackinac Island.

WEISIA VIRIDULA (L.) Hedw. Gravelly lake bluff; Colonial Point.

Grimmiaceae

GRIMMIA APOCARPA (L.) Hedw.* On sunny rocks; local along shore of Burt Lake; common on Mackinac Island.

Orthotrichaceae

ORTHOTRICHUM AFFINE Schrad.* Trunks of hardwood trees in the woods; frequent. Several localities near Burt Lake; Big Stone Bay.

ORTHOTRICHUM ANOMALUM Hedw. Sunny limestone boulders. Rare at Big Stone Bay; common along shore at Mackinac Island.

ORTHOTRICHUM BRACHYTRICHUM Schimp.* On hardwood tree in woods adjoining Smith's Bog.

ORTHOTRICHUM OBTUSIFOLIUM Schrad. Bark of trees in woods; frequent. Reese's Bog; Smith's Bog.

ORTHOTRICHUM SORDIDUM Sull. & Lesq.* Trunks of hardwood trees; frequent on Mackinac Island.

ORTHOTRICHUM SPECIOSUM Nees. Trunks of trees in woods; frequent. Reese's Bog; Big Stone Bay; Mackinac Island.

ULOTA CRISPULA Bruch. On trunks of broadleaf trees; frequent in open woods. Reese's Bog; Carp Creek; Big Stone Bay.

ULOTA LUDWIGII Brid.* On bark of tree in hardwood forest west of Pellston.

ULOTA ULOPHYLLA (Ehrh.) Broth. On trunk of tree; Mackinac Island.

Funariaceae

FUNARIA HYGROMETRICA (L.) Schreb. Common on earth in open situations generally, but especially abundant in burnt-over places.

Bryaceae

BRYUM ARGENTEUM L. Locally abundant on earth in a door-yard; Colonial Point.

BRYUM BIMUM Schreb.* On the ground; common in swampy or wet woods.

BRYUM CAESPITICIMUM L. Frequent on sandy or gravelly lake shores. Fairy Island; Colonial Point; Cecil Bay.

BRYUM CAPILLARE L. Sandy or gravelly ground; frequent in open woods.

BRYUM DUVALII Voit.* Locally abundant in wet open swamp; Reese's Bog.

BRYUM PALLESCENS Schleich.* Local along sandy shore of Lake Michigan near Big Stone Bay.

BRYUM PENDULUM (Hornsch.) Schimp. Frequent along sandy shore of Lake Michigan, near Big Stone Bay.

BRYUM VENTRICOSUM Dicks.* On ground in swampy woods. Reese's Bog; Cecil Bay.

LEPTOBRYUM PYRIFORME (L.) Wils. On earth; frequent in moist, open situations. Fairy Island; Smith's Bog; Gorge; Burt Lake Bluffs.

MNIOBRYUM ALBICANS (Wahl.) Limpr.* Open springy ground; locally common at northern end of Burt Lake.

POHLIA CRUDA (L.) Lindb. Common on a gravelly lake bluff; Douglas Lake.

POHLIA NUTANS (Schreb.) Lindb. On the ground and on stumps and logs in open situations; very common.

POHLIA PULCHELLA (Hedw.) Lindb.* Locally abundant on a moist clayey bank; Mackinac Island.

RHODOBRYUM ROSEUM (Weis) Limpr. On logs and the ground; occasional in moist woods. Burt Lake; Reese's Bog; Pellston Hardwoods; Big Stone Bay; Mackinac Island.

Mniaceae

MNIUM AFFINE Bland. On ground; common in wet woods.

MNIUM CILIARE (Grev.) Lindb. On ground in wet woods; probably frequent. Colonial Point.

MNIUM CUSPIDATUM (L.) Leyss. On logs and earth; common in upland woods.

MNIUM DRUMMONDII Br. & Sch.* Swampy woods; rare. Reese's Bog.

MNIUM MARGINATUM (Dicks.) Beauv. On ground and logs; frequent to common in moist upland woods.

MNIUM MEDIUM Br. & Sch. On the ground in moist woods; apparently rare. Colonial Point.

MNIUM ORTHORRHYNCHUM Br. & Sch. Moist earth and bases of trees; common on lake bluffs and in wet woods.

MNIUM PUNCTATUM (L.) Schreb. Common in wet woods. Practically all material seen from this region is referable to the var. *elatum* Schimp.

MNIUM ROSTRATUM Schrad.* Wet woods near Burt Lake; probably frequent.

MNIUM RUGICUM Laur.* Springy roadside northeast of Burt Lake; also Douglas Lake vicinity. Local.

MNIUM SPINULOSUM Br. & Sch. Earth and logs in moist woods, but especially on lake bluffs; frequent. Fairy Island; Polypody Bluff; Reese's Bog; Big Stone Bay.

MNIUM STELLARE Reich.* Frequent to common on moist, shaded banks, or on tree bases in wet woods.

Aulacomniaceae

AULACOMNIUM ANDROGYNUM (L.) Schwaegr.* On moist, shaded banks; local. Vincent Lake; Carp Creek; Burt Lake Bluffs.

AULACOMNIUM PALUSTRE (L.) Schwaegr. On the ground; common and usually abundant in bogs, swamps, and wet woods.

Meesiaceae

MEESIA TRIQUETRA (L.) Aongstr.* Local in open, sedgy bog at Mud Lake.

Bartramiaceae

BARTRAMIA POMIFORMIS (L.) Hedw. Locally abundant on a steep gravelly lake bank; Polypody Bluff.

PHILONOTIS FONTANA (L.) Brid. Open springy places and along streams; frequent. Reese's Bog; Cecil Bay; Mackinac Island.

PHILONOTIS MARCHICA (Willd.) Brid.* Local on open, springy banks near shore of Burt Lake.

PLAGIOPUS OEDERI (Gunn.) Limpr.* Frequent on moist, shaded limestone ledges; Mackinac Island.

Timmiaceae

TIMMIA CUCULLATA Michx. Moist shaded banks; rare. Reese's Bog; Mackinac Island.

Hedwigiaceae

HEDWIGIA ALBICANS (Web.) Lindb. On sunny rocks; local. Colonial Point; Cecil Bay.

Fontinalaceae

FONTINALIS LESCURI Sull.* On stones and logs in streams; rare. Fontinalis Run (Ehlers and I.. Blinks); Scotty Bay Creek (Ehlers).

FONTINALIS NOVAE-ANGLIAE Sull.* In streams; occasional. Carp Creek; Maple River; Levering and Scotty Bay Creek (Ehlers).

Leucodontaceae

LEUCODON SCIUROIDES (L.) Swaegr. On trunks of trees; common, especially in hardwood forests.

Neckeraceae

NECKERA PENNATA (L.) Hedw. Trunks of trees; very common in moist woods.

Entodontaceae

PLATYGIRIUM REPENS (Brid.) Br. & Sch. Occasional on moist logs in woods, especially on bark of fallen birches. North Fishtail; Carp Creek; Colonial Point Hardwoods.

PTERIGYNANDRUM FILIFORME (Timm) Hedw. Occasional on roots of trees along a low lake bluff; Bryant's.

PYLAISIA INTRICATA (Hedw.) Br. & Sch. On the bark of a tree; Mackinac Island.

PYLAISIA POLYANTHA (Schreb.) Br. & Sch. On bark of trees; Reese's Bog.

PYLAISIA SCHIMPERI Card. On trunks of aspen and other trees; frequent in open woods.

PYLAISIA SUBDENTICULATA Schimp.* On trunks of hardwood trees; frequent in open woods. Douglas Lake; Big Stone Bay.

Leskeaceae

ANOMODON APICULATUS Br. & Sch. On trunks of broadleaf trees; frequent in hardwood forests. Vicinity of Mud Lake and Pellston; Big Stone Bay.

ANOMODON ATTENUATUS (Schreb.) Hüb. On moist earth and bases of trees; occasional. Douglas Lake; Big Stone Bay; Mackinac Island.

ANOMODON MINOR (Beauv.) Fürn. On trunks of trees and logs; common in hardwood forest..

ANOMODON ROSTRATUS (Hedw.) Schimp. At the base of trees and on earth or rocks; occasional in upland woods. Fairy Island; Colonial Point; Big Stone Bay; Mackinac Island; Prentiss Bay (Ehlers).

ANOMODON VITICULOSUS (L.) Hook. & Tayl.* On limestone rocks, or occasionally on trees; common on Mackinac Island.

ELODIUM LANATUM (Stroem) Broth.* On the ground in swamps; frequent. Reese's Bog; Gorge.

HAPLOCLADIUM MICROPHYLLUM (Sw.) Broth.* On rotten logs; occasional in wet woods. Smith's Bog; Colonial Point (Ehlers).

HETEROCLADIUM SQUARROSULUM (Voit) Lindb.* On the ground and at the bases of trees; rare in upland woods. Big Stone Bay.

LESKELLA NERVOSA (Schawegr.) Loeske. Bases of trees and rocks; common in woods.

LINDBERGIA AUSTINI (Sull.) Broth.* On trunks of hardwood trees in woods northeast of Burt Lake; very rare.

MYURELLA GRACILIS (Weinm.) Lindb.* Moist crevices of limestone rocks; frequent along the shore of Mackinac Island.

MYURELLA JULACEA (Vill.) Br. & Sch.* Rare on a gravelly lake bluff at Bryant's.

RAVIA SCITA (Beauv.) Aust.* On bark at the base of trees; occasional in upland woods. Mud Lake Hardwoods; Colonial Point; Pellston Hardwoods; Big Stone Bay.

THUIDIUM ABIETINUM (L.) Br. & Sch. Dry sand, gravel, and rocks in open situations; local. Shores of Douglas Lake; Cecil Bay; Big Stone Bay; Mackinac Island.

THUIDIUM DELICATULUM (L.) Br. & Sch. On logs and ground in moist woods. Frequent.

THUIDIUM RECOGNITUM (Hedw.) Lindb.* On logs and ground in moist or wet woods. Common.

Hypnaceae

ACROCLADIUM CUSPIDATUM (L.) Lindb.* On the ground in bogs and marshes; locally abundant. Mud Lake Bog; marsh south of Burt Lake; Alanson.

AMBLYSTEGIELLA CONFEROIDES (Brid.) Loeske.* Limestone cliffs and boulders; common on Mackinac Island.

AMBLYSTEGIELLA SUBTILIS (Hedw.) Loeske.* On bark of broadleaf trees; common in upland woods.

AMBLYSTEGIUM COMPACTUM (C. Müll.) Aust. Local along springy lake bluff at Colonial Point.

AMBLYSTEGIUM IRRIGUUM (Wils.) Br. & Sch.* On wet banks, stones, and logs; common along streams, frequently growing in the water. Common.

AMBLYSTEGIUM IRRIGUUM SPINIFOLIUM Schimp.* Scotty Bay Creek (Ehlers).

AMBLYSTEGIUM JURATZKANUM Schimp. On earth and logs; not uncommon in moist woods.

AMBLYSTEGIUM KOCHII Br. & Sch. On wet ground and in pools; occasional in swamps bordering Douglas and Burt Lakes.

AMBLYSTEGIUM ORTHOCLADON (Brid.) Card.* On base of tree along lake-shore at Polypody Bluff.

AMBLYSTEGIUM RIPARIUM (L.) Br. & Sch. Floating in the water or growing on roots, branches, logs, and ground subject to periodic inundation. Frequent to common in swamps and springs

AMBLYSTEGIUM SERPENS (L.) Br. & Sch. On the roots and at the base of trees, and on earth; frequent. Polypody Bluff; Burt Lake Hardwoods; Colonial Point.

AMBLYSTEGIUM VARIUM (Hedw.) Lindb. On earth and tree bases; frequent in moist woods.

CALLIERGON CORDIFOLIUM (Hedw.) Kindb. Locally abundant on the ground in swamps and wet woods. Several localities in vicinity of Burt Lake.

CALLIERGON GIGANTEUM Schimp.* On the ground in bogs and swamps; common and locally very abundant.

CALLIERGON STRAMINEUM (Dicks.) Kindb. On the ground in bogs; local. Bryant's, Gleason's, and Mud Lake Bogs.

CHRYSOHYPNUM CHRYSOPHYLLUM (Brid.) Loeske. Earth, rocks, roots, and stumps; frequent in wet woods. Reese's Bog; Big Stone Bay; Mackinac Island.

CHRYSOHYPNUM HISPIDULUM (Brid.) G. Roth. On earth, roots of trees, and stumps; frequent in moist woods. Douglas Lake; Mackinac Island.

CHRYSOHYPNUM POLYGAMUM (Br. & Sch.) Loeske. Locally abundant on wet sandy lake shores and in marshes. Douglas Lake; marsh south of Burt Lake.

CHRYSOHYPNUM SOMMERFELTHII (Myr.) G. Roth.* Wet woods near Burt Lake.

CHRYSOHYPNUM STELLATUM (Schreb.) Loeske. Frequent in marshes and wet wooded swamps, growing on the ground. Pine Point; Carp Creek; Crooked River; Cecil Bay.

DREPANOCLADUS ADUNCUS (L.) Warnst. (*Hypnum uncinatum* Hedw.) Banks, rocks, logs, tree bases, and wet depressions; frequent in moist woods. Reese's Bog; Smith's Bog; Carp Creek; Cecil Bay; Big Stone Bay; Mackinac Island.

DREPANOCLADUS FLUITANS (L.) Warnst. Locally abundant on periodically inundated ground; Smith's Bog.

DREPANOCLADUS KNEIFFII (Schimp.) Warnst. On the ground or floating in the water; common in bogs and swampy woods, on springy banks, and in wet

situations generally. Under *D. Kneiffii* are here included a number of forms formerly referred to *Hypnum aduncum* Hedw., but more recently treated by various authors as distinct species. Some of these forms may indeed be specifically distinct, but their status in this respect seems altogether too uncertain to warrant attempting to separate them at the present time.

DREPANOCLADUS REVOLVENS (Sw.) Warnst.* Frequent in marshes and swamps, and along springy banks. Pine Point Bog; Cecil Bay; Big Stone Bay; Mackinac Island.

DREPANOCLADUS SCORPIOIDES (L.) Warnst. Locally abundant in wet marshes. Pine Point; Cecil Bay.

DREPANOCLADUS SENDTNERI (Schimp.) Warnst.* Floating in pools in open swamps; locally abundant near Burt Lake.

DREPANOCLADUS SENDTNERI WILSONI Warnst.* Smith's Bog.

DREPANOCLADUS TRIFARIUS (Web. f. & Mohr.) Broth.* Wet sandy marshes; local at Pine Point and Cecil Bay.

DREPANOCLADUS VERNICOSUS (Lindb.) Warnst. Local in wet, open bog; Mud Lake.

HETEROPHYLLON HALDANIANUM (Grev.) Kindb. On rotten logs and earth; common in moist woods.

HOMOMALLIUM ADNATUM (Hedw.) Broth.* On tree bases and gravelly banks; occasional in open woods. Fontinalis Run (Ehlers); Colonial Point.

HYGROAMBLYSTEGIUM FILICINUM (L.) Loeske.* Springy places and along streams; locally very abundant. Gorge; Mackinac Island.

HYGROHYPNUM PALUSTRE (Huds.) Loeske. On wave-washed logs and wet rocks; rare at Burt Lake Bluff and on Mackinac Island.

HYLOCOMIUM SPLENDENS (Hedw.) Br. & Sch. Common on the ground in moist woods.

HYPNUM SCHREBERI Willd. On ground, logs, and stumps; one of the commonest mosses of moist woods.

ISOPTERYGIUM ELEGANS (Hook.) Lindb.* Moist woods, usually on earth or rocks; rare. Mud Lake Hardwoods and Carp Lake Hardwoods (Ehlers); Big Stone Bay.

ISOPTERYGIUM TURFACEUM Lindb. Common in moist woods, usually on decaying logs.

PLAGIOTHECIUM DENTICULATUM (L.) Br. & Sch. Gravelly lake bluffs, and on the ground in wet woods; frequent.

PLAGIOTHECIUM ROESEANUM Br. & Sch.* Occasional on moist shaded banks. Polypody Bluff; Fairy Island; Burt Lake Hardwoods.

PLAGIOTHECIUM STRIATELLUM (Brid.) Lindb. On the ground or logs; frequent in moist woods. Reese's Bog; Burt Lake Hardwoods.

PTILIUM CRISTA-CASTRENSIS (L.) De Not. On the ground, logs, and stumps; frequent in moist woods. Reese's Bog; Cecil Bay.

RHYTIDIADELPHUS TRIQUETRUS (L.) Warnst. On the ground in moist woods; common.

STEREODON CUPRESSIFORMIS (L.) Lindb. Shaded logs and stumps; infrequent. Colonial Point (Ehlers); Mackinac Island.

STEREODON IMPONENS (Hedw.) Lindb. On logs and stumps in the woods; common.

STEREODON LINDBERGII (Mitt.) Warnst. Swamps, springy roadsides, and wet woods; common.

STEREODON PALLESCENS (Hedw.) Lindb. On logs, stones, and tree bases in woods; common.

STEREODON PRATENSIS (Koch) E. G. Britton. On the ground in swamps; frequent. Reese's Bog; Big Stone Bay.

STEREODON RECURVANS (Schwaegr.) Broth.* On logs and humus in the woods; common.

STEREODON REPTILIS (Michx.) Mitt. On logs, stones, and tree bases; common in moist woods. Douglas Lake; Cecil Bay.

Brachytheciaceae

BRACHYTHECIUM CYRTOPHYLLUM Kindb.* On a steep gravelly lake bank at Polypody Bluff.

BRACHYTHECIUM OXYCLADON (Brid.) Jaeg. & Sauerb. Earth and bases of trees; common in open woods.

BRACHYTHECIUM PLUMOSUM (Sw.) Br. & Sch. On earth; rare in open woods along lake shore at North Fishtail.

BRACHYTHECIUM RIVULARE Br. & Sch.* On wet ground; common in springy woods, especially along streams, often growing in the water.

BRACHYTHECIUM RUTABULUM (L.) Br. & Sch. Earth, stones, trees, and logs; occasional in moist upland woods. Burt Lake Bluffs; Burt Lake Hardwoods.

BRACHYTHECIUM RUTABULUM FLAVESCENS Br. & Sch.* Wet grassy roadside; Mackinac Island.

BRACHYTHECIUM SALEBROSUM (Hoffm.) Br. & Sch. On the ground and on the roots and bases of trees; frequent in upland woods. Grapevine Point; Smith's Bog; Cecil Bay.

BRACHYTHECIUM STARKEI (Brid.) Br. & Sch.* Earth and rotten logs; occasional in wet or moist woods. Reese's Bog; Colonial Point; Mackinac Island.

BRACHYTHECIUM VELUTINUM (L.) Br. & Sch. On earth in open woods; Cecil Bay.

BRYHNIA GRAMINICOLOR (Brid.) Grout.* Local on a steep, gravelly lake bluff at Fairy Island.

BRYHNIA NOVAE-ANGLIAE (Sull. & Lesq.) Grout.* On the ground; occasional in springy woods. Burt Lake Hardwoods.

CAMPTOTHECIUM NITENS (Schreb.) Schimp. On the ground in wooded swamps; frequently abundant. Reese's Bog.

EURYNCHIUM DIVERSIFOLIUM (Schleich.) Br. & Sch.* Locally abundant on shaded gravelly hillsides; Colonial Point.

EURYNCHIUM STRIGOSUM (Hoffm.) Br. & Sch. Earth, logs, and bases of trees; common in moist woods.

OXYRRHYNCHIUM RUSCIFORME (Neck.) Warnst.* On rocks in a stream; Scotty Bay Creek (Ehlers).

Dendroidaceae

CLIMACIUM AMERICANUM Brid. On logs and the ground; common in swampy woods.

CLIMACIUM DENDROIDES (L.) Web. f. & Mohr. On logs and the ground; frequent in wet woods. Bryant's; Smith's Bog.

Weberaceae

WEBERA SESSILIS (Schmid.) Lindb. On an earth bank in moist upland woods; Colonial Point.

Buxbaumiaceae

BUXBAUMIA APHYLLA L. On earth banks rich in humus; local in woods along Carp Creek and at Colonial Point.

Georgiaceae

GEORGIA PELLUCIDA (L.) Rabenh. On rotten logs and stumps; common in moist woods.

Polytrichaceae

CATHARINEA ANGUSTATA Brid. On earth; frequent in open upland woods. Mud Lake; Smith's Bog; Burt Lake Hardwoods; Colonial Point; Pellston.

CATHARINEA UNDULATA (L.) Web. f. & Mohr. On earth; occasional in moist open woods. Grapevine Point; Mud Lake Hardwoods; Burt Lake.

POLYTRICHUM COMMUNE L. On the ground in all sorts of situations; common and abundant.

POLYTRICHUM DECIPIENS Limpr.* Locally abundant on moist earth in hardwoods near Carp Lake (Ehlers).

POLYTRICHUM FORMOSUM Hedw.* Frequent on moist earth in hardwoods west of Pellston.

POLYTRICHUM JUNIPERINUM Willd. On the ground in open situations; very common and abundant.

POLYTRICHUM OHIOENSE Ren. & Card. Occasional on earth banks in Colonial Point Hardwoods.

POLYTRICHUM PILIFERUM Schreb. Dry, open ground; common and abundant.

POLYTRICHUM STRICTUM Banks. On the ground in bogs; probably frequent. Reese's Bog.

By way of summary it may be stated that, so far as published records show (and as tabulated in the present paper), the bryophyte flora of Michigan com-

prises a total of 321 species, distributed as follows: Marchantiaceae 4, Ricciaceae 2, Metzgeriaceae 9, Jungermanniaceae 56, Anthocerotaceae 1, Sphagnaceae 17, Bryaceae 232.

YALE UNIVERSITY

LICHENS OF THE LAKE GEORGE REGION

STEWART H. BURNHAM

(Continued)

148. *Peltigera aphthosa* (L.) Willd. On earth and mossy rocks; common. Specimens collected Oct. 18, 1905, near Tripoli are reported in the N. Y. State Mus. Bull. **105**: 24. 1906; having the thallus variegated with whitish patches, which is due apparently to the epidermis having been eaten by some small creature.
149. *Peltigera canina* (L.) Willd. Growing in locations similar to those of preceding species; abundant.
150. *Peltigera canina sorediata* (Schaer.) Fink. Wooded bank west of Tripoli cemetery, May 30, 1918; determined by Mr. Merrill.
151. *Peltigera canina spongiosa* Tuck. "This variety occurs . . . near Warrensburg." (Peck) in N. Y. State Mus. Rep. **53**: 854. 1900. Ravine southern base of Sugar Loaf Mt., Sept. 19, 1917; east of Thompson's gravel-bed, July 8, 1917. East of Tripoli in low woods, Nov. 12, 1913; determined by Mr. Merrill, who says "with portions of the thallus developing a mat of rhizoids below as in *v. spongiosa* Tuck."
152. *Peltigera canina undulata* Del. Peaked Mt., Oct. 23, 1918; determined by Mr. Merrill.
153. *Peltigera horizontalis* (L.) Hoffm. Rotten wood at Shushan, July 7, 1907 (Dobbin); falls in West brook, W. Fort Ann, Aug. 20, 1907; rocks near Wiggins iron mine, June 8, 1917, determined by Mr. Merrill.
154. *Peltigera polydactyla* (Neck.) Hoffm. Hulets I. g. (Jelliffe); Shushan, June 9, 1907 and Cambridge waterworks swamp, Sept. 2, 1913 (Dobbin); Black Mt., Barber trail, Aug. 19, 1909.
155. *Peltigera rufescens* (Neck.) Hoffm. Hulets I. g. (Jelliffe).
156. *Peltigera rufescens praeextata* (Flk.) Nyl. Peaked Mt., May 26, 1918, on thin rocky soil; stones in woods southeast of Vaughns schoolhouse, Aug. 19, 1914. Both collections determined by Mr. Merrill, who says, "unrecognized by others in America but I have identified it from many localities."
157. *Pertusaria amara* (Ach.) Nyl. West of Tripoli schoolhouse on trunks of *Juglans cinerea*, Dec. 5, 1914; determined by Mr. Merrill.
158. *Pertusaria globularis* Ach. Peaked Rock on *Hedwigia albicans*, May 19, 1906.
159. *Pertusaria leioplaca* (Ach.) Schaer. E. Galway on *Castanea dentata* (Burt);